

Re: micro power square wave oscillator

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- *From:* Joerg <notthisjoergsch@xxxxxxxxxxxxxxxxxxxxxxxxxxxx>
 - *Date:* Thu, 03 Jul 2008 07:40:22 -0700
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Martin Brown wrote:

Jonathan Kirwan wrote:

On Wed, 02 Jul 2008 16:12:15 -0700, Joerg
<notthisjoergsch@xxxxxxxxxxxxxxxxxxxxxxxxxxxx> wrote:

<snip>

First, low voltage. A fresh silver cell is just 1.55V. Then the clock never really feeds anything except the input of a divider chain within the chip. They'll probably do their darndest to keep its capacitance to a minimum.

It does seem clear that's important.

They also current limit the drive to the crystal. PIC datasheets have a warning in the small print to use a series resistor when using watch crystals in low power mode to avoid overdriving them. I have seen the odd PIC manage 12uA running on a 3v supply with a 32768Hz xtal (ISTR the CPU's square wave clock is then 8192Hz) which isn't too far off the spec.

100kHz would obviously be a bit more thirsty for juice.

A square wave oscillator won't be a nice resonant architecture. So you'll have to muscle capacitive charges around and it will consume more power. It's like wanting to rapidly move the pendulum of a grandfather's clock between its end points. This is why the OP might want to think about whether it really has to be a square wave.

Loose use of words? I assumed he wanted a good squarewave buffered output, but probably does not care about the internals.

Re: micro power square wave oscillator

Sure, that's why I suggested to try a very low power VCC monitoring chip as oscillator. Whether it'll get low enough in I_c I don't know, haven't tried yet.

That was helpful. Do you imagine that they may use an LC, though, and attempt to retain as much energy there as possible? Or, as you seem to suggest to me, graduate the transfer of charge more trapezoidally and not use magnetic field storage, at all?

The crystal is gently driven and the sine waveform amplified by a buffer to generate the square wave clock. An xtal has very high Q so it doesn't need much encouragement apart from initially to start up.

Yes, but one has to watch out for capacitances in the last stage, the one to square up the waveform. Every pF counts.

I kind of imagine that the usual crystal model most of us are likely to use has also been tremendously refined by watchmakers into a very, very proprietary one -- one that models the physics much better -- and that they use that in combination with thoughtful design. But I have to say that everytime I think about trying to do a 32kHz oscillator at very low power using discrete parts I just learn to appreciate how much good work has gone into what is now a very cheap watch.

I suspect it would be OK using a watch xtal 32kHz or 100kHz. Although I have never tried to do it with discrete parts.

He might need a custom made 100kHz crystal or try something on the 3rd of a watch crystal but that won't be exactly 100kHz.

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Regards, Joerg

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